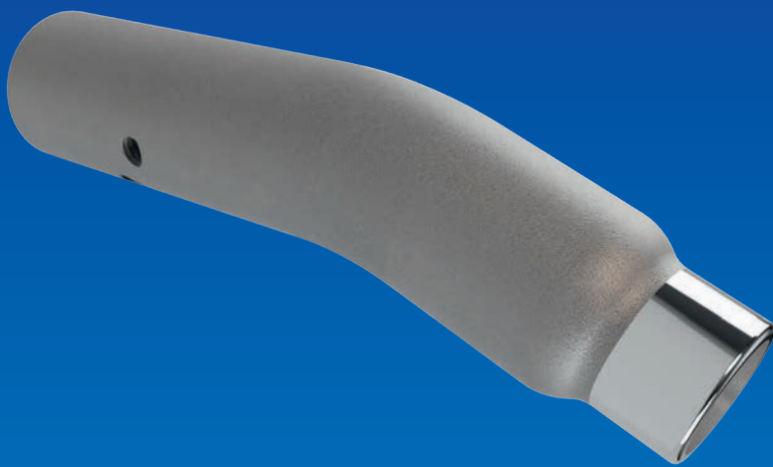


VIBENITE®

REDEFINING WEAR RESISTANCE

VIBIN
COMPONENTS

Your application of choice can be printed with Vibenite® materials



Benefits:

- Extreme hardness levels
- Excellent wear and fatigue resistance
- No porosities and full hardness all the way through
- Uniform material microstructure, thanks to the AM-HSS™ process
- Very fast product development
- 3D printable

VIBENITE® MATERIALS

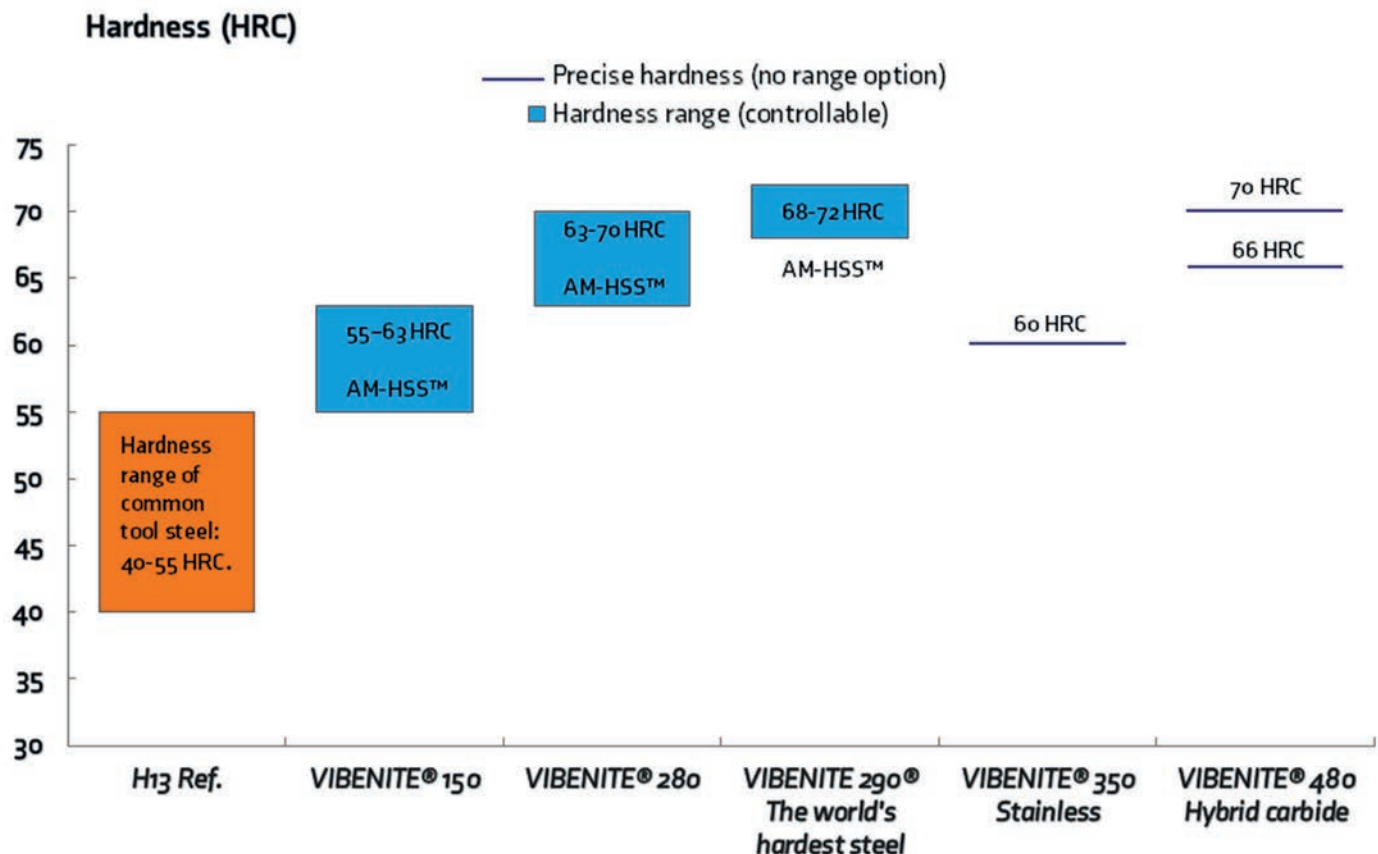
VBN Components has created a range of 3D printed, extremely hard, wear and heat resistant metals, to be used for components in demanding applications. We provide engineering and contract manufacturing services as well as license solutions for manufacturing in your own premises.

The Vibenite® materials share several benefits. Thanks to the additive manufacturing process, you have the chance to design complex geometries, combine several parts into one, add channels for media, reduce weight, or add other features to your component without any machining. You can also look forward to fast product development since your ideas can be easily implemented by simply creating a new 3D CAD drawing! The materials are produced from gas atomised metal powder and are

therefore classified as powder metallurgy (PM) materials. The method is called AM-HSS™.

All Vibenite® materials are extremely wear resistant and hard thanks to the ultrafine and uniform microstructure. The hardness and toughness can be tailored by the heat-treating steps in individual ranges. The high performance combined with less unnecessary material use leads to long lifetime, high productivity, and cost savings.

Hardness of Vibenite® materials compared to H13, a common tool steel



VIBENITE® 150

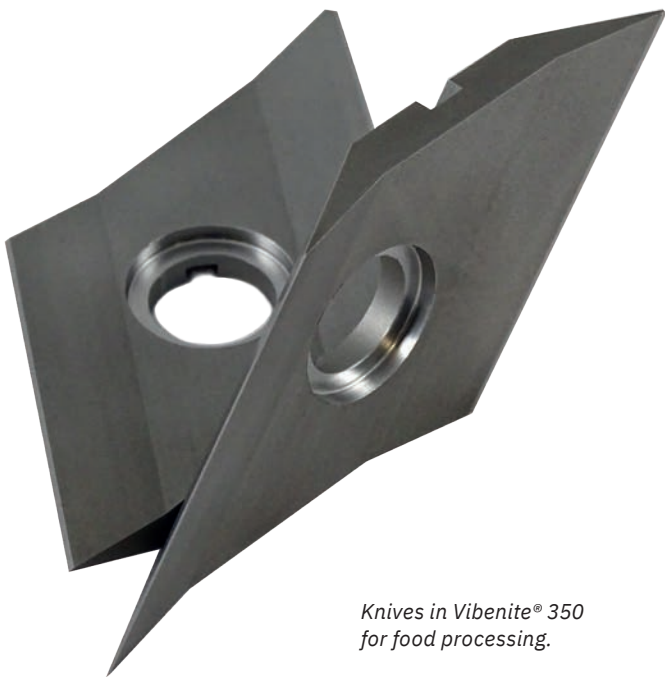
Tough multi-purpose material

A multi-purpose wear-resistant PM steel with a high level of toughness and fatigue resistance. It has a fine-grained Fe matrix and a hardness of approximately 58–64 HRC (600–780 HV). It works well for functional prototypes, parts difficult to machine, tool holders, cold work applications that place demands on both wear resistance and toughness, plastic materials processing tools and wear parts.

VIBENITE® 350

Corrosion resistant multi-purpose material

This stainless PM steel is well suited to high-wear applications that need stainless properties, such as plastic processing tools (extrusions and injection tool parts, segments for segment screws), pumps and valve rings. Its high hardness of approximately 60 HRC (680–700 HV) and high chromium content provide good wear and corrosion properties and it is ideally suited to products such as pump impellers or valves, where there is a requirement for both complex shapes and high performance. These types of alloys are normally extremely difficult to machine.



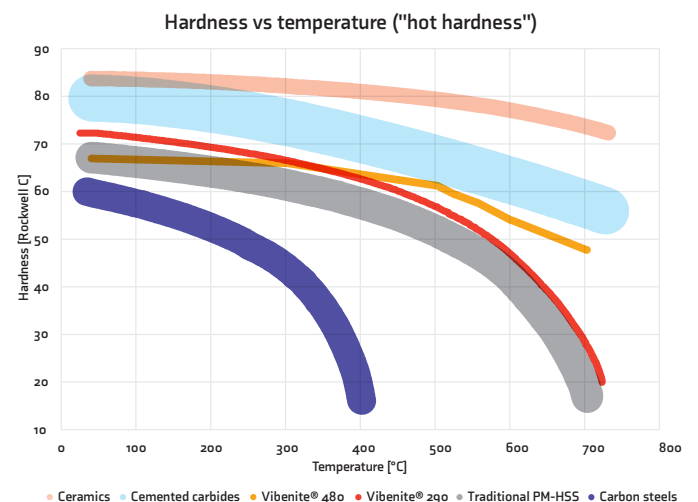
Knives in Vibenite® 350 for food processing.

VIBENITE® 480

A new type of cemented carbide

3D printed cemented carbide (hardmetal) has previously been considered “impossible” to print due to high carbide content. However, Vibenite® 480 contains an astonishing ~65% of carbides. No mixing, drying, pressing or sintering is required, as in traditional processes. It has a long-term heat resistance of 750°C, a hardness of approximately 66 HRC (860–870 HV) and is corrosion resistant and magnetic. Recently printing parameters to achieve a hardness of 70 HRC (1000 HV) have been developed (released 2023).

Vibenite® 480 is a good choice for applications where steel is normally used, but where replacing it with hardmetal would increase production efficiency, as well as towards hardmetal applications with complex geometry. Since it combines the two material worlds of PM high-speed steel and cemented carbide, it is referred to as a “hybrid carbide”. Vibenite® 480 allows the production of much larger components in a single piece than what is possible using conventional hardmetal manufacturing techniques. This adds to the number of potential usage areas and offers new opportunities for the production of prototypes.



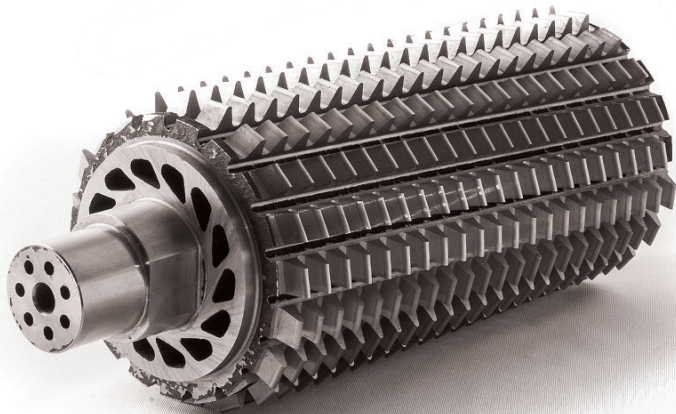
The hot hardness of Vibenite® 480 printed with standard parameters at 66 HRC (orange line) compared to other typical materials. (Hardness of 70 HRC available as of 2023).

As Vibenite® 480 possesses excellent wear properties, especially in wet wear, and is able to withstand heat and corrosive environments, it is a popular choice for mining as well as for oil & gas applications.

VIBENITE® 280

High hardness and wear resistance

Vibenite® 280 is an extremely wear and heat-resistant PM material, especially suitable for cutting applications such as gear hobs, broaches, shaper cutters and wear parts, or as a hard, heat-resistant substrate material for PVD coatings. The fine microstructure with high volume of fine, well-dispersed carbides results in a high toughness. Its hardness is in the range of approximately 63–70 HRC (780–1000 HV). It has proven to raise production capacity for industrial tools, for instance in



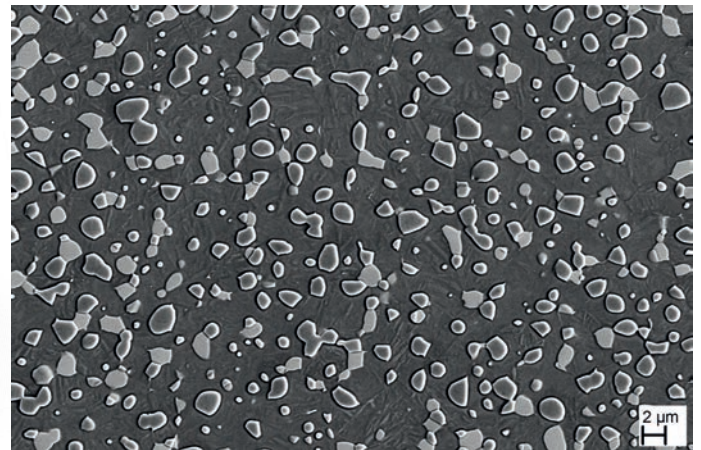
Vibenite® 280 gear hob reduces production costs by 30–40%.

engine production. Extreme erosive resistance has also been noted in customer applications.

VIBENITE® 290

The world's hardest steel

The hardest commercially-available steel type in the world: possible to harden up to approx. 72 HRC. It improves your existing HSS applications that need higher hot hardness or higher abrasion resistance. Vibenite® 290's high Co content gives a very heat-resistant hard alloy, while its high quantity of carbide formers generates extreme levels of carbides. The result is outstanding wear resistance with an exceptional combination of toughness and hardness. The unique composition of Vibenite® 290 results in a material perfect for metal-cutting tool applications such as gear-cutting hobs, power-skiving cutters, shaper cutters and dry-cutting applications.



Typical microstructure showing an extremely high amount of fine, well-dispersed carbides in a martensitic Fe-Co matrix. Total carbide content is approximately 25vol%.

This sample is hardened at 1180°C and tempered at 560°C for 3x1h, resulting in Vibenite® 290 hardened to 72 HRC.

Disclaimer

This material specification is only valid as a guideline without binding guarantees. The 3D printing process followed by hardening and possible grinding must be well controlled. Vibenite® is a patented product and a registered trademark owned by VBN Components AB. The statement "the world's hardest steel grade" is based on a comparison with traditional market-available forged and rolled steel bars, which cannot be as highly alloyed as Vibenite® 290. But similar, hard steel types could be available. There are no "correct" Vickers to HRC conversions. Different indentation loads give different results in a multiphase material.